

C., canines.

d. C., deciduous canines.

1, 2, 3 P.M., premolars.

1, 2, 3 d. P.M., deciduous premolars (commonly called deciduous molars).

1, 2, 3 M., molars.

LVI.—*Descriptions of some Indian and Burmese Species of Assimineæ.* By WILLIAM T. BLANFORD, A.R.S.M., F.G.S.

IN Dr. E. von Martens's "Conchological Gleanings," published in the March Number of the 'Annals' for 1866 (ser. 3. vol. xvii. p. 202), the first portion of the paper consists of observations "on some species of *Assimineæ*." Two new species from China and Singapore are described, and a list is added of the forms belonging to this genus known to the author. Amongst these the only species mentioned as occurring in India or Burma is the well-known *A. Francisci*, Gray*, from the estuary of the Ganges. The object of the present notice is to call attention to some species of the genus inhabiting Bombay and described some years since by Dr. Leith, and to describe two other species—one from Bombay, collected by the Rev. Mr. Fairbank, and another obtained by myself, in 1862, from the estuary of the Irawaddy in Burma.

Three species from Bombay were described by Dr. Leith as a new generic form, under the name *Optediceros*, in the 'Journal of the Bombay Branch of the Royal Asiatic Society' †, vol. v. p. 145. The paper, I learn from Dr. Leith, was presented to the Society in 1853, and published in July of that year, although the completed volume of the Society's Journal bears the date 1857. It is entitled "Note on an apparently New Genus of Gasteropod, by A. H. Leith, Esq., M.D." The genus is described as "a minute mollusk inhabiting the shores of Bombay Island, by the edges of salt-water pools, moving on the moist earth or rocks, and taking shelter under stones," and is distinguished by the following characters:—

* Called *A. Francesia*, Benson, by H. & A. Adams in the 'Gen. Rec. Moll.,' *A. Francesia*, Gray, by Benson in the 'Journal of the Asiatic Society of Bengal,' and *A. Francesi*, Gray, by Troschel (Geb. d. Schneck.). I cannot procure the work containing the original description in Calcutta.

† That Dr. von Martens was unacquainted with this paper is evident (indeed it appears to have entirely escaped the observation of conchologists), the description of the animal and operculum being excellent and amply sufficient to prove its identity with *Assimineæ*. It is greatly to be regretted that this paper is, so far as I am aware, the only published contribution to malacological science by one of the most careful observers in India. That the paper should have been overlooked is not surprising, as the Bombay Journal, though rich in archæological and geological papers, contains but few zoological contributions.

"The animal has a broad short foot, a head expanded into a broad and slightly emarginated lip, used as a fore foot, only two tentacles, which are short, nearly cylindrical, contractile, and bearing the eyes on their summits. The respiratory opening is a round perforation in the mantle, behind the right tentacle.

"Operculum is horny, with subspiral lines running from a nucleus near the columella.

"Shell subumbilicated, with an elevated spire; aperture rounded below and at the summit angular; peristome edged, at base effuse; lips united by callus, which encroaches on or even covers the umbilicus."

The above description is amply sufficient to prove the identity of the genus with *Assimineæ*. I have had the advantage of examining the animal of one species, which corresponds precisely with Dr. Leith's account and also with the animals of other forms of *Assimineæ* which I have examined elsewhere.

The specific descriptions of the three forms named by Dr. Leith, although ample for the purpose of discriminating them, are scarcely sufficient, in some respects, to distinguish them from other forms of *Assimineæ*; and I therefore give more detailed descriptions below.

Subsequently the Rev. S. Fairbank found a fourth species, which he distributed under the MS. name of *O. rotundum*. Of this no description has ever been published.

This note would have been sent sooner, but that I was in hopes of receiving authentic specimens of the various Bombay species. In this I have succeeded: both Dr. Leith and Mr. Fairbank have, most obligingly, not only compared my specimens of the shells with their types, but have also most liberally supplied me with typical specimens as well as with notes on the habitat of the several mollusks.

Assimineæ cornea, Leith, sp. (Fig. 1.)

A. testa subobtectæ perforata (interdum imperforata), conoideo-ovata, cornea, glabra, oleoso-nitente, vix striatula. Spira conoidea, lateribus convexis, apice acuto, sutura impressa, non marginata. Anfr. 6, convexi, sensim accrescentes; ultimus subtus rotundatus, haud carinatus. Apertura spiram vix æquans, subovalis, obliqua, supra aperte angulata; peristoma rectum, margine externo tenui, columellari incrassato expansulo, umbilicum partim v. omnino tegente.

Operculum corneum, paucispirale, nucleo subbasali, interno. Long. 4, diam. 3, apert. long. vix 2 millim.

Hab. Bombay Island, on the mud-flats of the harbour shore, near high-water mark. "On tufts of grass at high-water mark" (Fairbank, MS.).

"Animal grey; lip subcrescentic" (Leith, *l. c.*).

Although doubtless locally abundant, this little mollusk does not occur so generally on the shores of Bombay Island as the next two species; and Mr. Fairbank informs me that, in a recent search, he failed to find it. It may be distinguished from most others of the genus by its rounded, gradually increasing whorls, and, in general, by its distinct perforation, which is only completely covered by the columellar margin of the aperture in two specimens out of fourteen which I have before me.

It is manifest that the name of this species was published before Dr. Pfeiffer's *Hydrocena cornea*, from Borneo, described in 'Proc. Zool. Soc.' for 1854, and shown by Dr. E. von Martens to be an *Assiminea*. The Number XVIII. of the 'Journal of the Bombay Branch, Royal Asiatic Society,' in which Dr. Leith's description appeared, was, as I have already mentioned, circulated to the members of the Society in July 1853. The Borneo species will therefore require to be named afresh—a task which, as I am unacquainted with it, I would prefer leaving to Dr. Pfeiffer.

Assiminea subconica, Leith, sp. (Fig. 2.)

A. testa imperforata, subrimata, ovato-conica, solidula, pallide aurantiaca, glabra, nitidula. *Spira* conica, lateribus vix convexis, apice acuto, sutura parum impressa, non marginata. Anfr. 7, subplani, sensim accrescentes, ultimus subtus rotundatus. *Apertura* spira multo brevior, parum obliqua, superne angulata; peristoma rectum, margine externo tenui, columellari vix incrassato expansulo.

Operculum præcedentis.

Long. 4, diam. $2\frac{1}{4}$, apert. long. $1\frac{1}{2}$ millim.

Hab. Same as that of *A. cornea*.

This small species has more the form of *A. Francisci* and its allies. The animal was found by Dr. Leith to be similar in colour and form to that of *A. cornea*. Mr. Fairbank informs me that he has found *A. subconica* at a rather lower level than *A. cornea*, on the mud, near high-water mark.

The colour of the shells in this and other species of *Assiminea* tends to fade after a time; and some of my specimens are rather yellowish horny than orange.

Assiminea marginata, Leith, sp. (Fig. 3.)

A. testa imperforata, subrimata, ovato-conoidea, solidula, olivacea, oleoso-micante, striatula, lineis minutissimis spiralibus sub lente signata. *Spira* conica, lateribus convexis, apice acuto, sutura parum profunda, linea impressa aliquando obsoleta late marginata. Anfr. 6, supra lente, infra celerius accrescentes, parum convexi; ultimus magnus, subtus globosus. *Apertura* spiram paulo superans, parum obliqua, supra acute angulata; peristoma rectum, margine externo tenui, columellari incrassato expanso.

Operculum simile ei *A. corneæ*.

Long. $4\frac{1}{2}$, diam. 3, apert. long. $2\frac{1}{2}$, lat. $1\frac{1}{2}$ millim.

Var. *major*. (Fig. 4.) Sutura non marginata; anfractibus 6-7. Long. 6, diam. 4, apert. long. $3\frac{1}{4}$ millim.

Hab. The same as that of the two preceding species. "Most abundant on the oozy mud at half-tide mark" (Fairbank, MS.).

"Animal scarlet; lip rectangular" (Leith, *l. c.*). The animal of this species I examined some years ago. The tentacles are very short and blunt, with the eyes on their summits.

This form must approach very closely to *A. pinguis*, Von Martens. It is the most nearly allied of all the Bombay forms to *A. rubella*, from Burma, described below. From its congener *A. cornea* it differs in the absence of perforation, flatter whorls, and greater size of the last whorl as compared with the others.

The name is unfortunate, as, although the margination was well marked on the small variety (two-tenths of an inch in length) to which the name was first applied, it is always indistinct and often absolutely wanting in larger specimens. To this Dr. Leith himself called my attention. Should the present name be objected to on this ground, that of *A. Leithi* might be substituted.

Assiminea rotunda, Fairbank, MS. (Fig. 5.)

A. testa imperforata, rimata, conoideo-globosa, solidula, striatula, oleoso-micante, coccinea, anfractibus superioribus sæpe albescentibus. Spira conoidea, lateribus convexis, apice acuto, sutura impressa, non marginata. Anfr. 6- $6\frac{1}{2}$, convexi; ultimus multo major, ventricosus, subtus rotundatus. Apertura spiram superans, fere verticalis, supra acute angulata; peristoma rectum, margine externo tenui, columellari subincrassato expanso.

Operculum simile ei *A. corneæ*.

Long. 4, diam. 3, apert. long. $2\frac{1}{4}$, lat. $1\frac{1}{2}$ millim.

Hab. Lives partly buried in the mud between tide-marks, rather lower down than *A. marginata* and *A. subconica*, in the same localities (Fairbank).

The animal is grey. Specimens of this species have been distributed in the United States and in England under the above name; but no description has hitherto been published.

Assiminea rotunda is a rounder and more ventricose form than any other of the Bombay species. It may also be recognized by the large size of the last whorl, and by its bright scarlet colour.

Assiminea rubella, n. sp. (Fig. 6.)

A. testa imperforata, subrimata, ovato-globosa, solida, glabra, oleoso-micante, striatula, rubra vel rubello-fusca, lineis binis impressis infra suturam sculpta, superiore persistente, inferiore juxta aperturam evanescente. Spira breviter conoidea, apice acuto, sæpe erosula, sutura vix impressa. Anfr. 5, parum convexi; ultimus multo major, ventricosus, non carinatus. Apertura spiram supe-

rans, subverticalis, supra acute angulata; peristoma rectum, margine externo tenui, columellari incrassato expanso. Operculum corneum, tenue, radiatim striatum, distincte paucispirale. Long. $5\frac{1}{2}$, diam. 4, apert. long. $3\frac{1}{4}$, lat. $2\frac{1}{2}$ millim.

Hab. Mud between tide-marks near Dalhousie, in the Irawaddy Delta.

Animal scarlet; proboscis bilobed, with a black spot above in the centre of each lobe. The ends of the proboscis are applied in walking. Tentacles and eyes as usual in *Assiminea*. The animal closely resembled that of *A. marginata*, Leith, in which, however, the black spots on the proboscis are wanting. The shell is perhaps, on the whole, more nearly allied to *A. rotunda*, Fairbank; but that species has no spiral lines below the suture, and the animal is differently coloured. *A. rubella* differs from *A. pinguis*, Von Martens, in being more globose, in having a double instead of a single impressed line below the suture, and in the colour of the animal.

I found *Assiminea rubella* very abundant crawling upon the mud between tide-marks, just above the port of Dalhousie in the Bassein river, one of the many mouths of the Irawaddy, but which, like several of the mouths of the Ganges, is for many months of the year an arm of the sea rather than a river, as it receives scarcely any fresh water except in the rainy season. The whole molluscan fauna of this portion of the Irawaddy delta is peculiar and very interesting, comprising a new genus of Rissoidæ, species of *Tectura*, *Martesia*, *Teredo*, and other marine forms, with fluviatile or estuarine types such as *Neritina*, *Cyrena*, and *Scaphula*. With the *Assiminea* a species of *Amphibola* occurred in abundance. A small form, apparently of the same species, occurs with the *Assiminea* of Bombay. I have described the molluscan fauna of the Irawaddy delta in a paper which will be published in the 'Journal of the Asiatic Society of Bengal.'

Within the last few days I have received from Mr. Damon specimens of an *Assiminea* from Borneo, which appear to belong to the present species. In one specimen there is only a single impressed line below the sutures; but in another there are two, which are even more strongly marked than in Burmese specimens.

The only other known species of *Assiminea* inhabiting India or Burma, as already observed, is *A. Francisci*, Gray. This abounds on the mud of the Hoogly and of various tidal creeks and canals around Calcutta; and a variety, differing in nothing except its rather darker and occasionally reddish colour, is found at Molmain in Burma. Specimens were found there, I think, by Mr. Theobald; and some were brought to me, amongst other shells, by a collector whom I sent to Molmain.

As regards the habits of *Assiminea*, I can, to a very great extent, confirm the remarks of Dr. von Martens. It is essentially

a brackish-water genus, living between tide-marks on the mud of estuaries. But species are to be found both in perfectly salt and in perfectly fresh water. The water of Bombay harbour is almost purely sea-water; and I have met with some of the Bombay species on the sea-shore at Bombay, far from the mouth of the harbour: on the other hand, the water of the Hoogly, where *A. Francisci* is found, is quite fresh. The latter species occurs also in brackish water, I believe; for, although I have not noticed it alive, dead shells are common in the brackish-water creeks east of Calcutta. The individuals that have been habituated to salt water, however, will not live in fresh, nor *vice versâ*. In Dr. Leith's description of *Optediceros*, he says of the animals generally:—"If put into salt water, they all quickly make their escape from it by creeping up the sides of the vessel; but if placed in fresh water, they close their opercula, and remain shut up until they die." I tried a similar experiment with *A. Francisci*, from the fresh water of the Hoogly. On placing the specimens in perfectly fresh water from a tank, all crawled out of the water; but on putting them in brackish water (not salt water), a few began to crawl about, but by degrees nearly all closed their opercula and remained at the bottom; and after half an hour only six out of about two hundred specimens had crawled out of the water. On throwing away the brackish water, and substituting fresh, all began moving about and creeping out of the water as usual.

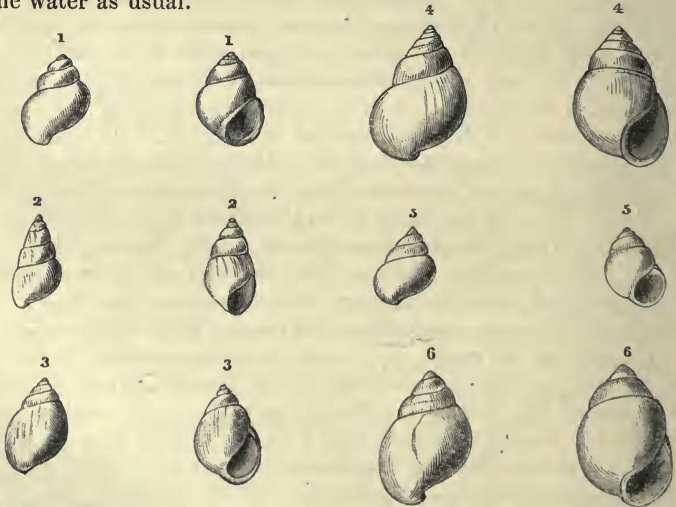


Fig. 1. *Assimineæ cornea*, Leith.

Fig. 2. *A. subconica*, Leith.

Fig. 3. *A. marginata*, Leith (type).

Fig. 4. *A. marginata*, var. *major*.

Fig. 5. *A. rotunda*, Fairbank.

Fig. 6. *A. rubella*, W. Blanford.